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ABSTRACT

This paper on interdisciplinarity and liberal education is based on the work of a task force of the Project Change in Liberal Education. The focus is those parts of the education process that bridge or integrate disciplinary approaches and create a different kind of learning that would still be liberal education. The following factors that indicate the complexity of interdisciplinary programs are discussed: Jantsch's typology for interdisciplinarity; choosing appropriate models; achieving an integration of content materials; modifying administrative support systems; determining the costs of interdisciplinarity; and dealing with such matters as team-teaching, curricular and developmental sequencing and individualizing interdisciplinary studies. Recommendations that deal with planning and implementation are presented. An annotated bibliography is included that provides direction on finding information about interdisciplinarity and its practice and that defines the use of terms like multidisciplinarity, transdisciplinarity, and unidisciplinarity. (SW)

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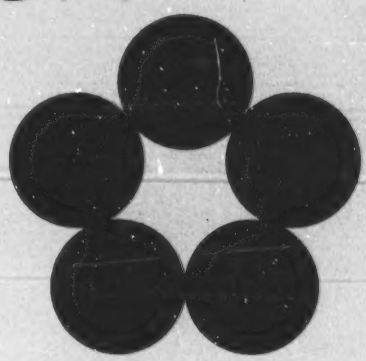

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RESOURCES FOR RENEWAL:

INTERDISCIPLINARITY

Les Humphreys

CHANGE IN LIBERAL EDUCATION

An action-research project for the renewal
of undergraduate liberal education

Sponsored by

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PREFACE

This is one of a series of reports, Resources for Renewal, being prepared as a product of the Project Change in Liberal Education (CLE). Each report in the series is based on the work of one of the seven CLE Task Forces:

Liberal education for work and leisure

Alternative curricula for liberal education

Liberal education for values and human development

Liberal education for nontraditional learners

Change strategies and educational futures

Management of change and professional development

Evaluation of liberal education

Problem-solving task forces focus the work of the CLE Network. From within the broader project, self-selected groups of faculty members, administrators, students and interested persons outside of higher education form the task forces. They share information, provide mutual support and criticism and engage in collective problem-solving on significant issues they face in their institutions. The shared purpose which binds them together, and task force to task force, is renewal of undergraduate liberal education.

Members of task forces are among the hundreds of people at 30 colleges and universities in CLE. They come from most academic disciplines, represent all ages, academic ranks and geographical areas. Some of the colleges are deliberately experimenting institutions. Most do not claim that title. The institutions cover the spectrum

of American higher education. All are actively creating an alternative curriculum for undergraduate liberal education. All have progressed. After the first two and a half years there are new programs in being serving over 17,000 students. Participants have used the task forces to solve conceptual and practical problems in order to translate theory to practice in living institutions.

This series of reports presents the issues confronted in the task forces. The authors are CLE staff members who coordinated and facilitated task force activities. From their perspective, they have attempted to link the practical concerns for renewal at specific institutions as expressed by task force members to broader conceptual issues. Each identifies people, programs, books, or other materials which have proven useful to CLE participants.

It is in the lives of those who shape a given institution that renewal of liberal education begins. From an idea or a felt need the process must be translated into practice. The social, economic and political reality of a given institutions must be confronted. Creation of alternative curricula cannot be done otherwise. The experience of those in the continuing CLE Network is offered as a resource for those who seek renewal in other colleges and universities.

Francis J. Wuest
Project Director

Leavenworth, Kansas
June 1978

INTRODUCTION

Some college presidents and administrative officers ask, "Why should my institution become involved with a liberal arts program that is interdisciplinary?" The structure of much of what is generally regarded as being included in the concept of liberal arts education is geared to presenting information from the point of view of separate disciplines. This is done through departments and courses and is seemingly done well. Sometimes a school has special "interdisciplinary programs". These are frequently isolated from the main track of the liberal arts curriculum. They are often temporary additions. And, they have built-in administrative problems.

Assessing educational benefits and related costs is different in an interdisciplinary program than in a single course. Determining what is an equitable, cost-effective faculty work load in a team-taught program poses other difficulties. Evaluation of faculty performance for promotions, tenure and salary increases is yet another of the most common problems to be solved. There are many more.

And, is interdiscplinarity a fad? Is it merely a partial response to some of the questions of "relevancy" raised during the 1960's? Isn't it time to return to the basics, to the course distribution requirements which were abandoned during the period of turmoil in higher education in the late '60's and early '70's?

Won't the restoration of these requirements and basic competencies to the curriculum deal with the problem of "floating" in a world where the image of a renaissance person is clearly incompatible with the massive quantities of data needed to make even

tentative judgments about our interlocked sets of social and political problems?

Some say that for a college or university to "return to the basics" at this point would be as futile as adding another safety lock to the lower decks of the Titanic. Collective knowledge is too complex, too broad and too deep, to be brought back into a tight fisted grip of surety comparable to what many academics presumed that they had prior to our entering into a post-industrial world.

The argument continues that the possibility of providing a liberal arts education for the young has somehow slipped through our fingers. Even if we structure colleges around core curricula and distribution requirements we cannot prepare our students to grasp the complexity of the inter-connectedness of our universe, this planet, our cities, our governance structures--even the enormous com/perplexity of our inner lives. Therefore it will do no good to organize our academic lives into clusters of courses (Western Civilization, English Composition, etc.) and other basic staples in the hope that, somehow, our students will put it all together for themselves as they pick and choose from these disciplinary units. Faculty may well claim the impossibility of teaching the liberal arts as an entity within a course, but students are somehow expected to develop the prescience to integrate on their own.

In this context of the "generous education" of the sixties pulling back into the "general education" of the seventies, a second set of variables arises. If courses cannot encompass the liberal arts, then perhaps whole colleges and universities can. Perhaps the process of stepping back and looking at the whole structure of a

college can demonstrate ways in which the individual within that institutional framework can find sufficient resources to put together a world view with dimensions such as objectivity, clarity of words, and rigorous specificity of content that will lend themselves to the phrase, "a liberally educated person".

This is the challenge for academic administrators over the next ten years. Dealing with issues such as enrollments, faculty assignments, budgets and other customary business must fall within the context of demonstrating that what happens educationally at a college or university will lead people to the conclusion that the liberal arts are being served--and served well.

THE PROJECT ON CHANGE IN LIBERAL EDUCATION (CLE)

In 1973 the Carnegie Corporation funded a project sponsored by the American Association of Community and Junior Colleges (AACJC), American Association of State Colleges and Universities (AASCU), American Association of University Professors (AAUP), Association of American Colleges (AAC), and the National Association of State Universities and Land Grant Colleges (NASULGC). The Project's general aims were to explore the ways in which liberal education was--and could be--done at various colleges and universities throughout the country. Active involvement in the creation of "interesting" alternative curricula for liberal education was the criterion for participation in the Project. Thirty institutions--varied by size, affiliation, educational mission, clientele, location, etc.--accepted an invitation to become partners in this exploration.

Considerable time was spent in the initial sessions asking questions such as "What is liberal education?" "How does if differ

from general education?" "Can the liberal arts be taught?" No uniform definitions emerged, but some working understandings were achieved. Liberal education was "not" professional education. Its amorphous dimensions included such ideas as: education that is liberating; learning which aids a sense of whole-person development; acquisition of skills and competencies which enable people to cope with change, etc. The liberal arts as historically understood were perceived to be evolving—once largely limited to the humanities, they now included the sciences and the social sciences, and are coming to include the intra-personal realm.

To focus the Project on more sharply significant issues, participants formed a series of task forces. Faculty members, students, administrators created these groups designed for mutual support and information-sharing while solving the conceptual and practical problems encountered in creating their curricula. One task force focused on Interdisciplinarity and Liberal Education. It concentrated on those parts of the education process which bridge (or integrate) disciplinary approaches, creating a different kind of learning which would still be liberal education within the dimensions outlined above. Of the thirty colleges and universities in the Project, a significant number were planning, developing, implementing or evaluating interdisciplinary programs. Among other activities, they planned and participated in several workshops designed to assist with curricular development. Some of the schools which formed the Change in Liberal Education Task Force on Interdisciplinarity had proposed specific programs which were based on interdisciplinary goals:

Temple University (Interdisciplinary Freshman Year)
East Texas State University (New Center for Learning)
Oklahoma City University
Mendocino College (World Food Problem)
Merrimack Valley College
Moorhead State University
Johnston College of the University of Redlands
Incarnate World College
Los Angeles Harbor College
The Massachusetts State College System (Unified Studies Program--Boston State College)
Evergreen State College
University of Wisconsin/Green Bay
Hampshire College
College of Saint Catherine
Governors State College
Ottawa University
Austin College

All of the colleges and universities involved in the Project had at least one representative who was involved in an interdisciplinary interest. Individuals and institutional planning groups worked within their institutions and together in the CLE Network. The proceedings of task force workshops reveal these as the most salient characteristics of the creation of interdisciplinary curricula.

First, there is a simplicity to interdisciplinarity which justifies the use of this approach and which provides a rationale for curriculum development. Even with this rationale, however, extreme complexity is encountered in "doing" interdisciplinarity. The experience of task force participants is the source of recommendations for action in the face of complexity. Simplicity, complexity and recommendations are considered in the following three sections.

THE SIMPLICITY OF INTERDISCIPLINARITY

In spite of the problems of structuring interdisciplinary alternatives, the participants in Change in Liberal Education chose to confront this task. Their motivations differed, but they shared one vision. There was an underlying assumption that in this post-industrial world all of us must achieve a sense of perspective based upon healthy and holistic images of the likely future, and of the liberal learning to guide us there. Interdisciplinarity is one attempt to structure that kind of liberal education. It will not soon supplant the fragmented assembly-line model built from traditional college courses--that form of liberal education which has served the needs of an industrialized society admirably for the past two centuries. However, as the knowledge explosion makes more difficult the already difficult task of teaching and learning even the "basics" in traditional ways based solely on the disciplines, we will need interdisciplinary approaches, among others, to complement the more traditional modes of teaching/learning. That is why so many of the thirty colleges and universities in Change in Liberal Education chose to experiment with the creation of interdisciplinary curricula for liberal education.

CLE institutions clearly expressed their motivation to experiment with interdisciplinary education. They intended:

- to explore ways in which liberal education can become integrative rather than serially independent;
- to break down the isolation of compartmentalized knowledge;
- to develop holistic problem-solving techniques which would draw from disciplinary methodologies but would transcend their self-defined limitations; and

- to restructure curricular content and teaching modes so that both faculty and students can explore new knowledge and new learning techniques.

For faculty members, administrators and students who share these motives, the complex problems to be solved are an acceptable hazard. Interdisciplinary approaches offer relative simplicity in moving toward the desired outcomes. While offering a direct response to the sensed need for integration, enactment of interdisciplinary programs brings participants into direct confrontation with the other side of the issue, complexity.

THE COMPLEXITY OF INTERDISCIPLINARITY

Implementing interdisciplinarity gives rise to exceedingly complex issues. No member of the Project network has devised instant, universal answers to the problems raised in doing interdisciplinary liberal arts education. General agreement was reached that these problems focused on several areas:

1) Terminology. To many faculty and administrators the term, interdisciplinary, lacks clarity and precision. Some college catalogs treat programs as interdisciplinary if the student has a choice of several period or topic courses which are related only at this superficial level. Thus the Yellow Pages of Undergraduate Innovation, Change (1974), listed several hundred programs--the vast majority of which were just beginning to approach the problems of integration.

Erich Jantsch's typology* for the term interdisciplinarity is shown in Figure 1. It and his other writing on the topic provide the most complete framework to organize curricular structure and process.

Accepting common agreement about terminology is the first step in implementing interdisciplinary goals. In CLE we used the term "interdisciplinarity" as an umbrella concept encompassing cross-disciplinary, interdisciplinary, and so forth. We also relied upon a number of insights concerning interdisciplinarity articulated at the 1971 Conference on Interdisciplinarity in Nice, France and reported in the OECD publication: Centre for Educational Research and Innovation. Interdisciplinarity: Problems of Teaching and Research in Universities. Organization for Economic Cooperation and Development, 1750 Pennsylvania

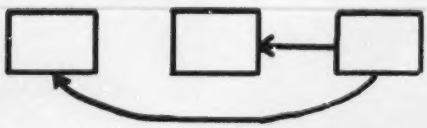
*Erich Jantsch, "Inter- and Transdisciplinary University. A Systems Approach to Education and Innovation" Higher Education I, #1 (February 1972), pp. 7-37.

JANTSCH'S TYPOLOGY FOR INTERDISCIPLINARITY
Figure 1

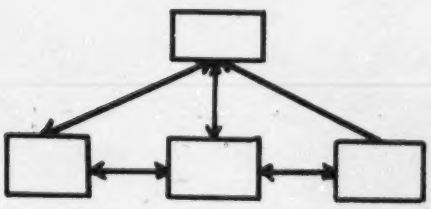
DISCIPLINARITY:
specialization in isolation

MULTIDISCIPLINARITY:
no cooperation

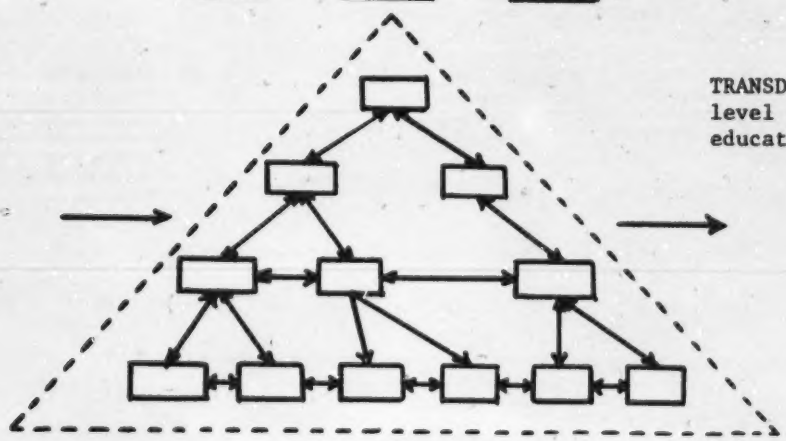
PLURIDISCIPLINARITY:
cooperation without
coordination



CROSSDISCIPLINARITY: rigid
polarization toward specific
monodisciplinary concept

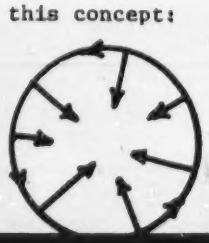


INTERDISCIPLINARITY:
coordination by higher-
level concept



TRANSDISCIPLINARITY: multi-
level coordination of entire
education/innovation system

I wish to add this concept:



UNIDISCIPLINARITY: human-
istic, holistic, generalist
and positivist

Avenue, N.W., Washington, DC 20006, 1972.

But even with this general agreement, other areas of difficulty needed to be explored.

2) Models. Participants in Change in Liberal Education discovered that there are significant variations in curricular models within the overall concept of interdisciplinarity itself. Upon superficial examination, it would appear that interdisciplinary simply means some sort of blending of disciplines. Much more than that is involved, however, in both the theory and implementation of interdisciplinary programs. There is at one level, for example, parasitic interdisciplinarity whereby what is taught in a particular course draws from other disciplines to augment or highlight its own effectiveness. The integrity of the isolated discipline is not compromised and the added dimensions of bits and pieces attached to the host discipline enhances that basic model.

At another level there is a type of symbiotic relationship between disciplines (cross-disciplinarity) which can lead to the creation of a new "super-discipline" (e.g., psycho-history, socio-biology, etc.). At still another level there can be a clustering of disciplines focused upon a particular problem or a problem-solving skill which draws from each of the disciplines, its own technical language and methodology (multi-disciplinarity). Finally, at still another level, there can be an attempt to meld the research methods and terminology from a variety of disciplinary sources to create a new transdisciplinary orientation which, based on the concept of synergy, is "more than the sum of its parts".

The development of curricular approaches around some one or

more of the above models will depend upon a number of factors: student interest, faculty background and skills, library and lab resources (which are almost always based on the disciplines), physical facilities, staff flexibility and so forth. Experience in CLE indicates that the actual choice of a particular model is not as significant as the clarity with which that model is perceived. In workshop sessions the two problems most often articulated by faculty and students "doing" interdisciplinarity were:

- how to avoid reinventing the wheel, and
- how to avoid trying to be all things to all people.

It was frequently expressed at workshop sessions that some faculty and students work best in a disciplinary structure. The limits seem clearer and curricular development seems more rational. For these individuals to try out anything other than a cross-disciplinary program as a starting point will usually result in fairly uniform frustration.

Knowing clearly which type of interdisciplinarity one is trying to implement is crucial. This is simply a reflection of the maxim that time should be spent in clarifying policy before practice is attempted. CLE participants emphasized the difficulty of focusing upon a particular form of interdisciplinarity and developing the specific expertise that that particular form required. Participants who were involved in projects that were clearly aimed at the more holistic and integrative transdisciplinary model experienced frequent tugs of conscience to hold onto the stability of their own disciplinary training. It was found that those projects which used senior faculty who were already respected in their disciplines fared best since there

was no question about the excellence and authority from which their forays into an interdisciplinary world stemmed. Junior faculty were often placed in the unenviable position having to prove their own disciplinary expertise while at the same time grappling with the complexity of new interdisciplinary knowledge and techniques for teaching. A mixture of senior and junior faculty often produced the greatest success since there is a possibility that an interdisciplinary perspective is simply time related. That is, senior faculty have had sufficient experiences to give depth to whatever curricular approach is proposed, while junior faculty do not necessarily carry the impediment of long time fixation within a discipline.

Until graduate schools prepare more prospective college teachers to be competent in the use of diverse research methods and lexicons of several disciplines, it is probably true that the richest experiences in interdisciplinary programs will be had by senior faculty. It is they who are already well grounded in a particular discipline and can afford to take risks with new approaches to liberal arts learning. It is they, too, who may already have done the job of integrating content material, which is a prerequisite for teaching in an interdisciplinary way.

3) Achieving integration of content material. For the past century, the division of the liberal arts into more and more specialized disciplinary areas has resulted in curricular offerings which tend to be identified as core or general education courses. The content of these courses for freshmen and sophomores has gone through numerous transformations, ebbing and flowing from narrow, rigorous, prescriptive content requirements to more general survey-type approaches approved

by curriculum committees. Teachers who are actually involved in the process of setting up this course goal, however, frequently throw up their hands in despair arguing that survey courses are impossible, and topic courses are inadequate. In addition, having abolished rigid sequences of courses in many colleges, it is difficult (or impossible) to monitor the developmental learning of each individual student from year to year.

Some teachers attempt to achieve interdisciplinary integration within their own classrooms. The feeling that there is too much to cover in a course often leads to an exclusive focus on one's own academic discipline as the source of most methodology and content. Team teaching done serially addresses this problem. But, it raises others. There are enormous difficulties in developing course outlines which blend the content of a traditional set of introductory courses, for example, in economics, history and sociology.

To expect that one single teacher will embody the depth and breadth of knowledge to teach even one small content area from a variety of disciplinary perspectives is unrealistic, given the nature of our graduate schools and the kind of specialized training that they tend to offer. There are a few more graduate schools which offer interdisciplinary training to prospective college teachers. It is still rare, however, to find an individual who can claim deep competency in more than one or two related disciplines.

In practice, many schools leave it to the student to integrate the bits and pieces picked up from what amounts to an academic smorgasbord. It is a very difficult task to get faculty to become involved with this kind of integration. Yet students are somehow expected

to pull it all together,

It is a basic anomaly of the American educational scene of the 1970's that the problems faced by college graduates in terms of finding jobs, shifting jobs and even changing vocations in mid-career, are not really addressed by colleges which specialize in narrow disciplinary programs. The nature of the liberal arts education is such that it should prepare people for flexibility in career planning. Yet the current trend toward career education (with the possible exception of a few areas like health care delivery systems, social ecology and engineering education) tends to be modeled on the traditional course/discipline/profession approach.

A basic question today is, can a person really become liberally educated without exposure to interdisciplinarity in a variety of ways? If the answer is yes, then the burden of providing this exposure should not fall exclusively on the shoulders of the students. The structure of a college must share this sense of responsibility for helping students transcend the boundaries of disciplines.

This is particularly true for adult and nontraditional student programs which often serve students who already have a sense of interdisciplinarity. The act of prior life experiences can make the traditional introductory Western Civilization course, for example, seem quite irrelevant or directed at the simple-minded. Faculty and administrators must take the first step in structuring interdisciplinary learning environments appropriate to their students. That demands that they attend to questions of cognitive and values development, learning styles, and the integration of cognition and affect related to their particular students in all parts of program design and implementation.

4) Administrative support systems. Part of the reason why it is so difficult to get faculty to integrate content materials is that most college and university support and reward systems are geared to disciplinary competence. Faculty evaluations for promotions are usually done by departments with clear guidelines for competency within a particular discipline. Course assignments are made on the basis of disciplines. Access to secretarial help, teaching fellows and research assistance is largely determined by one's academic department. In this milieu, faculty who wish to introduce interdisciplinary (or cross-disciplinary) courses are frequently placed at a disadvantage. The experience of CLE institutions which have been set up with administrative support systems expressly geared to interdisciplinary learning (for example, Evergreen State College) indicates that when the structure is conducive, growth towards interdisciplinarity is possible.

Making changes in administrative support systems in colleges where interdisciplinary programs are being planned can be exceedingly difficult. Examples of these difficulties range from matters such as credit hour equivalencies to changing transcript formats to reprogramming computers for cross registration. It is also no small undertaking to gear up for advertising, recruitment, admissions, and evaluation processes for a new interdisciplinary offering. Sometimes it is even necessary to revamp buildings and office facilities to foster ease of communication and other interdisciplinary needs. No administrator should minimize the effort needed to coordinate this kind of development.

In terms of preparing administrative staff and others for such interdisciplinary development, the problems are equally vexatious. Considerable systems work must be done to determine whether support

for an interdisciplinary program can be sustained. Often the experience of innovators is that preparation for administrative support is left to the last moment with the result that system overloads develop.

Interdisciplinary programs frequently evolve from faculty development programs. A consistent point of failure, however, seems to be the lack of follow through with staff and administrative development programs. Faculty frequently find themselves in a position of having a program to implement which does not fit current administrative practice. A thorough walk-through of the necessary support systems can alleviate much of this difficulty.

A word should be added also about the advantages and disadvantages of implementing interdisciplinary programs as add-ons as opposed to being built-in. Where grant money is involved, the tendency is to think of a new interdisciplinary project as an appendage to the existing curricula. Administrative support systems are often set up exclusively for the new project. These add extra weight to already existing staff work, and can result in staff resistance to implementation. Another disadvantage of perceiving interdisciplinary programs as add-ons resides in the difficulty which often occurs at the end of a funding period. It is all too easy to lop off an add-on. Integration of the program within the mainstream of the curriculum forestalls premature curtailment of a program. On the other hand, implementation of add-on curricula can simplify both the process and product evaluations which a new program should undergo.

The primary disadvantage of building into the curriculum a new interdisciplinary approach is that systems questions are addressed

before the fledgling project has a chance to solidify its approaches. There should be room for growth and change in an experimental project. And often it is not possible to provide this flexibility when the guidelines for development are hedged in by existing administrative practice. Again, however, the advantage of a built-in approach is that it creates bridges to existing structures which can provide supportive consultative work for both those doing the interdisciplinarity and those who are still in the mainstream. This applies to both faculty and staff connected with the interdisciplinary project.

A pattern which has developed in a number of cases seems to be that an interdisciplinary approach (e.g., American Civilization) will have been begun as a cross-department set of offerings. Subsequently the coordinator of these offerings will become a quasi-department chairperson. And eventually, a new department is spawned. This process does not really address the problems of interdisciplinarity in full unless what is intended is merely the creation of an interdisciplinary discipline.

5) Costs. One of the initial goals of the CLE Task Force on Interdisciplinarity was to determine whether or not interdisciplinary programs cost more than do those based on disciplines. Our experience indicates that if programs are carefully planned, the cost per student for interdisciplinary education can be equal to that for disciplinary education within a particular institution. Costs were found to be above the norm in planning and in faculty and curriculum development. In a number of cases, development costs were born by the local institution planning its project. In some, grant support was secured. In one such case it was found that in-kind contributions from the institution made a significant portion of a grant unnecessary.

Faculty development costs for an interdisciplinary program should not be underestimated. The programs which began with limited funds for faculty training and in-service released time were the ones which tended to have the most difficulty achieving program implementation. After the initial enthusiasm for development had become somewhat dulled, the hard reality emerged that faculty who wished to do interdisciplinary work, but whose training and teaching experience has been almost exclusively disciplinary, often did not have the information, methods and skills needed to bring the program to life.

There are also a number of hidden, but real, costs to be found in developing interdisciplinary programs. The time-effort needed to propose, plan, develop and implement a new program is enormous for the faculty and administrators directly involved. In CLE several projects were funded quite adequately. There was, however, still considerable danger to be found in a burnout rate for the most actively involved faculty and administrators. Faculty found themselves excited enough by their work (as well as taxed enough by its new demands) that "real" vacations did not happen. In some cases obligations to the institution (committee work, etc.) as well as those on a more personal level (professional research, family relations, etc.) suffered because of the draining needs placed upon individuals who developed new (and sometimes unpopular) programs within their institutions.

Nevertheless, it is clear that institutional costs can be, and indeed should be, no higher for interdisciplinary-based programs than for traditional curricula in the liberal arts. We have insufficient data at this time to determine whether or not interdisciplinary

programs are more effective in imparting liberal arts education. Drawing on the evaluation reports of several of the programs there are definite benefits--positive student response evidenced by more active, excited participation in reading, discussion, projects, etc.; positive faculty response to the quality of the teaching/learning experience with students and with the other faculty in the program. If the cost is not greater, and there are no obvious negative outcomes, then gains in attitude, motivation and morale alone could justify the experience of interdisciplinary programs.

6) Team teaching. A number of interdisciplinary programs have involved some form of team teaching. The literature in this area is extensive. The use of team teaching stems from the fact that given the disciplinary training of most faculty, it is necessary to link persons with varying background in order to achieve some sort of mix of these disciplines. The varieties of team teaching are enormous, but there are two basic generic approaches used most often:

- serial teaching, and
- integrative team teaching.

In the former instance (which is perhaps the most common) faculty interact with students sequentially throughout a semester or period of study. Sometimes this takes the form of an interdisciplinary lecture series in which faculty present materials from each of their disciplines to a group of students. In these cases, the real work of integration must be done by the students.

Often, however, faculty are called upon to prepare course outlines which dove-tail curricular content in such a way that faculty teams find it necessary to hold planning sessions in which real faculty

dialogue aimed at integration takes place. In these cases it is encumbent upon the faculty to do the preliminary work of integration. A whole series of packaged interdisciplinary curricula has been developed to ease this process. And a number of texts are now available which achieve somewhat the same purpose.

Moving further in the direction of true integrative team-teaching, some programs require that more than one faculty person be physically in the classroom at the same time during lectures, seminars, etc. This has placed serious administrative burdens on the institution. How does one figure contact hours in this form of team-teaching? All too often, faculty simply double the number of times they need to meet classes and hold individual conferences. Additionally, with this form of team-teaching, it is often necessary to cluster faculty office space in a cross-departmental way. This in turn leads to a number of interrelated decisions in terms of other support services such as administrative assistance.

The basic question seems to be to what extent faculty are expected to pre-digest materials for students and do the hard part of integrating content material across disciplinary lines. One school of thought would indicate that this adds too great a burden to faculty involved in getting an experimental program off the ground. This attitude also holds that it is good for the students themselves to assume the responsibility for integrating disciplines. On the other hand, it seems clear that faculty themselves are perhaps the best qualified to tackle the complexities of integrating disciplines and that they should not abrogate this responsibility.

All of the above notwithstanding, the most serious difficulty

in implementing interdisciplinary team-teaching resides foremost in finding that appropriate blend of personalities, teaching styles and content disciplines which will suit individual student and institutional needs. The variables here are enormous. The former dean of the College of Basic Studies at Boston University has said that in his twenty-five years of administering team-teaching units, the hardest problem he faced was in selecting the right individuals to do the job. Even people who use all the right words about interdisciplinarity, group dynamics, etc., don't always work out. One approach to the solution of this problem is to expand graduate school offerings of an interdisciplinary nature to such an extent that potential team-teachers can be identified early in their professional careers. Perhaps the least explored area in terms of structuring interdisciplinary teams is that of blending divergent teaching styles. The current work being done at the University of Massachusetts/Amherst and elsewhere in teaching style inventories will assist in this process. Clearly a basic lecture style does not blend well with a style which is predominately discussion. We need to know so much more about the subtleties of styles and their interaction that it is difficult at this time to structure teams of faculty in anything more than a somewhat haphazard way based on individual interest and energy.

7) Sequencing. The organization of an interdisciplinary program so that it coincides with adolescent and adult personal development (and also with various cognitive learning styles) as well as with the structure and order of the program's content is another major problem. In the past, much work has gone into developing appropriate schedules and sequences for learning various disciplines. Within

courses this means moving from simplicity to complexity or some other configuration selected by the instructor. Within curricula, this is accomplished by establishing course prerequisites for entry into advanced learning or fixed sequences of courses in a specified time period, e.g., one-year or two-year sequences in science, mathematics or language.

Interdisciplinary learning must develop its own stages and sequences. It would be naive to assume that a liberal education (or even what goes under the rubric of a general education) can be taught/learned as a uniform set of concepts and skills in terms of difficulty, abstraction and complexity. For example, a program which tries to incorporate economic theory and methods into a social science interdisciplinary program may find that it is necessary to offer a kind of mini-course workshop to introduce these theories and methods in a developmental way to students who have had no previous background in economics. Similarly, the rationale for learning certain types of mathematics in a demonstrably sequenced way precludes the use of that knowledge in an interdisciplinary context until students have gone through the basic sequence.

The equivalent of a carefully designed research project is required to develop a curriculum which is carefully sequenced to include and build on basic knowledge from a variety of disciplines, even when done as a theoretical exercise. When one considers the varying levels of sophistication and expertise of entering students, relating these characteristics to current research on the developmental learning patterns of adolescents and adults the problem becomes exceedingly complex.

8) Individualized interdisciplinarity. In addition to all of the concerns above, one other set of variables needs to be considered in the planning and implementation of interdisciplinary programs: This is the area of individualized education. The schema for personalized education, competency-based approaches and individualized tutorial approaches to learning are only partially linked to the development of interdisciplinary programs,

At a beginning level, the attempt to integrate disciplines by a single individual (whether faculty or student) may follow certain paths which are as yet not fully documented. Why is it that some individuals find it easy to do cross-disciplinary work while others cannot? What learning patterns exist which can predictably assist curriculum and faculty development work in building the necessary bridges for interdisciplinarity?

At yet another level, there is much that needs to be done to describe teaching style and curricular aims in such a way as to break out of higher education's emphasis on group learning environments. In terms of administrative structures, things like class hours, distribution requirements, etc., are almost always geared to group curricula and accounting procedures. If faculty wish to develop systems of individualized interdisciplinary learning they are almost always faced with significant departmental and institutional impedences. The use of individualized learning contracts, for example, can introduce all sorts of problems in areas such as final examination schedules and so forth. The work being done at Empire State College and elsewhere in individualized learning approaches is just beginning to demonstrate the complexities of adding this sort of realm to teaching and administrative concerns, and also demonstrating that it can be done.

SUMMARY. All of the factors listed above: typology of interdisciplinarity; choosing appropriate models; achieving an integration of content materials; modifying administrative support systems; determining the costs of interdisciplinarity; and dealing with such matters as team-teaching; curricular and developmental sequencing and individualizing interdisciplinary studies; provide indications of the complexity of implementing interdisciplinary programs. And while all of these things are evolving, a faculty person is expected to be continuing the development of expertise in his/her own field. The reward systems often demand this. It is no wonder that many college and university administrators and faculty persons throw up their hands at the prospect of meeting this challenge.

RECOMMENDATIONS

The current context for exploring interdisciplinary options is a part of the evolution of liberal arts education for the 1980's. If one accepts the assumption that we have entered a post-industrial world with shrinking margins and the by-products of future shock, one is forced to look at the current state of higher education in this broader perspective. The answers which have evolved over a two-hundred year period of industrial sub-paradigms may not be appropriate for a new post-industrial paradigm with its heavy philosophical dependence upon relativism (particularly in relation to the explosion of knowledge and, to use the current idiom, the "word processing" now taking place.)

Modes of learning the liberal arts which were quite appropriate to the preparation of an educated populace undergoing industrial growth experiences, may not make sense in a context of the escalating complexity and interdependence of our global society. The solutions to macro problems which have been attempted by multi-nationalism seem less apt to succeed than do those of the new feudalism of decentralization.

One of the primary difficulties to be faced in the coming years is discovering when "bigness" and "smallness" are appropriate. And a key to these discoveries will lie in the ability of decision-makers to see situations from the various perspectives fostered by interdisciplinarity. In the context of higher education, this means that a space will have to be carved out in which students who need, desire and can accommodate interdisciplinarity have this as an option.

The resurrection of core requirements, distribution requirements and narrow course sequences by disciplines which is currently

underway will not deal effectively with the need for helping students to integrate in holistic patterns and devise interdisciplinary methodologies. If we merely go back to what existed in the 1940's and 1950's in our "back to basics" push, we will not have addressed the real reasons why the curricular reforms of the 1960's and 1970's (whatever their merits) transpired. It is not enough to simply write these off as aberrations of excess caused by anti-war disenchantment with the system. The real changes in technology and multi-nationalism which took place in the 1960's and 1970's may have resulted in colleges and universities abrogating their roles for a time. But simple flashbacks to earlier curricula will not suffice.

In those instances where colleges and universities now have a choice in the "back to basics" movement, there must be reserved a place for the introduction of interdisciplinarity on a sizeable scale. The following recommendations deal with such planning and implementation:

- Institutions should allow for sufficient time to explore interdisciplinary alternatives before choices are made. Not all programs are suitable for particular learning environments and student populations. First, it is necessary to select the appropriate level of interdisciplinarity desired (pluri-disciplinary, cross-disciplinary, etc.). Next, this set of variables must be cross matrixed with decision-making which determines the extent of interdisciplinarity to be achieved (within single faculty classrooms, across intra- or inter-departmental lines, etc.). And finally, sufficient resources must be made available for planning and support service reorganization.

- During the planning stages, it is recommended that the integration of curricular content be explored by faculty first--before

much thought is given to the creation of interdisciplinary structures. In CLE programs it was a common experience to have spent a considerable amount of time on the latter and to have arrived at opening day with insufficient preparation of the former. It is easy to allocate time to questions of team-teaching, course equivalencies, etc., and to avoid until later the difficult process of pulling together curricular content from a variety of disciplines.

- It is also recommended that interdisciplinarity be implemented by faculty who are drawn predominantly from the ranks of senior professors. The burden imposed on junior faculty by having to prepare for tenure decisions, publications, etc., makes it difficult for them to cut themselves off from their disciplinary bases. Furthermore, there is considerable legitimacy lent to interdisciplinary experiments by senior faculty which gives weight to the innovation.

- Planning an interdisciplinary program should begin with both a faculty and an administrative development program. Interdisciplinarity should be considered as a built-in rather than an add-on change. To do this requires that it fit into the context of existing professional development programs.

- The administrative support systems needed for implementing interdisciplinarity should be modified as appropriate. But, it is better to wait until the curricular and methodological guidelines of the experiment are fairly well developed before dovetailing these with the administrative support services for which they will have need. This approach may result in greater administrator discomfort, but in the long run it will assist in the process of placing educational priorities first.

- If grant funding is sought, it is recommended that an

interdisciplinary experiment be placed on regular line budgets rather than being treated as a special funding project. An interdisciplinary project should be integrated within existing structures to as great an extent as possible as early as possible.

- Facilities re-design is often essential to the success of an interdisciplinary project. The cost should be included in the budget for implementation.

- The beginning of the implementation stage should be delayed until all of the above have been fully explored. Even if a program is in the planning stage for an extra year, this is better than starting up a program with an incomplete foundation. In particular, faculty will need more time than is usually anticipated to prepare integrated curricular materials. The transition to implementation should also include administrative staff retraining where that is appropriate.

- One of the most frequently stated problems in implementing an interdisciplinary experiment is that faculty spend more time administering the experiment than in teaching within it. This is particularly true of team-teaching situations. Ample support services must be provided--particularly during early start up.

- Interdisciplinary experiments should be given a long-range charter before full evaluation is completed. The experience of CLE projects suggests that process evaluation during this time is sufficient for making program modifications and that evaluation intended to determine whether the experiment should be incorporated into the general curriculum should be delayed until the experiment has had sufficient time to work out its bugs. In the case of a cross-disciplinary course, this might be two years. In the case of a team-taught program this evaluation time might be three (or more) years. In

academic planning and implementation, a time span of three to five years is not unduly long. Expecting attitudinal, curricular, content, methodological and program structural changes to be made in a hurry is to begin with an erroneous set of assumptions about the complexity of implementing interdisciplinarity. Undue haste and faculty burn-out are the primary reasons for the failure of interdisciplinary experiments.

- A final word about transdisciplinary institutional experiments: If these levels are sought, it would be wise to incorporate one of a variety of planning approaches such as Futures Invention, Delphi, etc. in the various stages of institutional exploration. The enormous difficulties of moving a whole institution into a transdisciplinary mode (as experienced for example at Evergreen State College) are such that facilitative planning is essential. A ten-year development cycle, or one even longer, is warranted. Nothing less than individual and institutional transformation would be the consequence of successful achievement of transdisciplinarity.

INTERDISCIPLINARITY: A SELECTED BIBLIOGRAPHY FOR USERS

A bibliography is often little more than a list of references at the end of an article on a particular subject. Sometimes it is annotated. But seldom does it provide a user with a process for finding information.

The purposes of this bibliography are to guide you in finding information about interdisciplinarity and its practice, and to help define the use of terms like interdisciplinary, cross-disciplinary, multidisciplinary, transdisciplinary and unidisciplinary. These words are now often used interchangeably, but as our experience with interdisciplinarity develops, each will take on meanings and usages which must be differentiated according to the conceptual framework and practices we adopt.

This bibliography is for the general reader. It is personal, historical and selective, focusing on four obstacles to creation of interdisciplinary programs:

- How does interdisciplinarity resolve the problem of generalist versus specialist education?
- How should educators deal with the multiple levels of interdisciplinarity?
- How is it possible to create a new uniform language and set of research predispositions so that genuine transdisciplinary communication can take place?
- And how can instructional systems which are now so heavily weighted towards discipline oriented education be changed?

It is organized developmentally: 1) getting ready to think about interdisciplinarity; 2) thinking about interdisciplinarity; and 3) implementing interdisciplinarity.

I. GETTING READY

To get ready to think about thinking about interdisciplinarity, I would suggest that the reader start with:

Eiseley, Loren. The Immense Journey. New York: Vintage Books, 1957.

Fuller, R. Buckminster and Marks, R. The Dymaxion World of Buckminster Fuller. Garden City, New York: Anchor Books, 1960, 1973.

Eiseley's book deals with time and space. Fuller's world is one of space and time. Since Einstein, it has become necessary to devise a new metaphor for time. The pre-Newtonian concept that "time is like a river" no longer fits the world view of time/space relativity. What will this new metaphor be? And how will it enter popular consciousness? It may be that the evolution of the awareness of the unity of time and space will in itself hold a key to the evolution of interdisciplinarity. One approach that I have been "playing" with lately is the idea that "time is a place." This has changed my thinking about interdisciplinarity considerably. Thus, the progressive era in education might be thought to have been an exciting "place" in which to teach.

The purpose for reading writers like Eiseley and Fuller is that they free up the mind. What is at stake in the study of interdisciplinarity is, after all, a new paradigm. Teachers and learners who see education as a centrifugal fractioning process will never get to the point of seeing the centripetal power of integrative learning. Old paradigms give way to new ones because of anomalies. The Newtonian world view could not abide the mathematical inconsistencies found by researchers during the nineteenth century. The new paradigm which resulted has only partially infiltrated the public consciousness. To better understand the process by which this will happen, one should read:

Kuhn, Thomas. The Structure of Scientific Revolutions, 2nd edition Chicago: University of Chicago Press, 1962, 1970.

This work is Volume II, Number 2 of the projected Inter-

national Encyclopedia of Unified Sciences and is subtitled "Foundations of the Unity of Science." It is really without common wonder that scientists were among the first to fraction learning (during the late Renaissance) and that they are now among the first to see the unity of scientific knowledge.

The term cross-disciplinary can adequately be used to describe the evolution of fields like bio-chemistry, bio-sociology, and astro-physics.

Teachers and learners who take their humanities seriously would do well to trace the problems raised by this evolution of cross-disciplinary research through the use of a book such as:

Asimov, Isaac. Asimov's Guide to Science. New York: Basic Books, 1972.

A next natural transition for humanistic educators might be the study of creative thinking through metaphors found in:

Gordon, William J. Synectics. New York: Macmillan Publishing Company, 1968.

Since the Second World War, Bill Gordon has been using the process of synectics to help business people and academics solve problems metaphorically. Any trip to Boston should include a visit to:

Synectic Education Systems, Inc.
121 Brattle Street
Cambridge, MA 02138
617/868-5747

In sum, the study of interdisciplinarity should begin within a context of questioning that may ultimately upset a teacher's/learner's paradigm about learning itself. Interdisciplinarity may lead the reader to see a wholly new way to think and learn. At the very least, it will open to question the efficacy of the current idiom concerning learning by discrete disciplines alone.

II. THINKING ABOUT INTERDISCIPLINARITY

The contexts for thinking about interdisciplinarity are not new. From Plato to Rousseau, the value of inquiry in a "whole" sense is either overtly advocated or covertly practiced. But, with the confluence of the scientific and commercial (r)evolutions of the Sixteenth through Eighteenth Centuries and the addition of the industrial (r)evolution preceding World War One, the pattern of "learned learning" becomes one of increasingly fractioned studies of discipline.

Critics of this "traditional liberal" model of education do not find the analogy of the education industry to the factory system too tart. They see schools in the Twentieth Century as assembly lines (K through college) with teachers acting as quality control inspectors certifying students as running from "grade A" to reject and recycle. Educational architecture mimics the textile mill Punch clocks and bells start and stop learning. And the curriculum is rationalized into discrete units of production: a time for reading, a time for geography, a time for composition, and a time for nature study.

While this factory model for traditional liberal education grates the sensitivities of those who see teaching as a form of art, it is a true representation of the values and practices of an industrialized society applied to its educational substructure. In all candor it must be recognized that this form of fractionated learning has indeed served industrial society well--producing (and that word is carefully chosen) a goodly number of doctors, engineers, poets, and the other learned persons needed to cause that society to run.

Some, however, will argue that in a post-industrial world that a quite different set of social needs must be served by schools. For me, the watershed year was 1970 when the book:

Silberman, Charles. Crisis in the Classroom. New York: Random House, 1970,

appeared. Prior to Silberman's study, the bulk of the new writing (by Goodman, Holt, Kozol, Dennison, Leonard, Friedenberg, et al) tended to articulate only what was "wrong" with the traditional liberal model (and its "reformed" post-Sputnik varieties). Crisis in the Classroom collects all of these critiques in poignant sequences reminiscent of Frederick Wiseman's film High School,

but then goes on to offer new alternatives based upon the experiences of the integrated day programs which evolved in post-war England. This transition is crucial. Since Silberman's writing, educators seem to be getting down to the nitty-gritty of changing (as opposed to reforming) liberal education.

The underpinnings for these changes have come, ironically enough, from a revolution which failed: the progressive era. In a biased and grossly simplistic way, I see the broad brushstrokes of the past two hundred years as having created a view something like this: Liberal ideology supplanted absolutism (usually by revolution) during the Eighteenth and Nineteenth Centuries. A variety of socialist ideologies came to dominate political and educational thinking in the nonindustrialized world during the Nineteenth and Twentieth Centuries and these ideologies have melded with traditional liberal capitalism (since the 1930's) in such places as the United States, Russia, and Western Europe. The populist and progressive movements of the period 1870 to 1940 were cut short respectively by the First and Second World Wars. But, it is these ideologies which are now finding renaissance in the "cooperative" (i.e., populist free school) and "open" (i.e., neo-progressive school) movements of the 1960's and 1970's.[1]

In order to think about interdisciplinarity, the reader should, therefore, think about the success and failure of the first progressive movement in education by reading:

James, William. Talks to Teachers on Psychology. New York: Dover Publications, 1899, 1962.

Dewey, John. Interest and Effort in Education. Carbondale, Ill.: Southern Illinois University Press, 1913, 1975.

Whitehead, A. N. The Aims of Education. New York: Free Press, 1929, 1967.

And the best chronical of a college that I know of which spans the latter years of the progressive movement is:

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[1] I initially felt that I should apologize for these generalizations as not being complex enough, but then realized that it is simply my training in discipline-oriented education which makes a taboo of generalization.

Duberman, Martin. Black Mountain. Garden City, NY: Anchor Books, 1973.

The "new historiography" presented by Duberman is remarkable, and if I had to select but one road map for educational innovation, this would probably be it.

A note of warning. Interdisciplinary "innovators" who get into progressive ideology should sense the tightness and rigorousness requisite for neo-progressive thought. The conservative critique by:

Hook, Sidney. "John Dewey and his Betrayers" in C. Troost (ed.) Radical School Reform. Boston: Little, Brown, 1973.

is fully warranted. "Free" schools have gotten a bad name within the educational establishment because they read the word "freedom" in Dewey but did not see the words "responsibility" and "social need."

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The next step (both personally and chronologically) in thinking about interdisciplinarity is to become familiar with the evolution of the "integrated day" programs found in the British model of open education. Some information will already have been found in Silberman's Crisis in the Classroom, but a short book that I see as particularly useful is:

Featherstone, Joseph. An Introduction: Informal Schools in Britain Today. New York: Citation Press, 1971.

Featherstone's comment that the curricula of the primary schools in England are evolving mostly from teachers rather than devolving from curriculum designers is particularly interesting. Teachers themselves must be the first to see the need for integration of the disparate activities in which they are involved.

A new bibliography is now available which will provide additional information on the English models:

McNichols, John. The Design of English Elementary and Primary Schools: A Selected Annotated Bibliography. New York: Humanities Press, 1973.

The thinking about interdisciplinarity going on in other parts of the world seems to me to be far more advanced than the ad hoc "programming" and "curriculum creating" that occupies much of the literature on interdisciplinarity in the United States.

If I had to select but three sources on interdisciplinarity to provide philosophical depth for thinking about the concept, they would be:

Piaget, Jean. Main Trends in Interdisciplinary Research. New York: Harper and Row, 1970, 1973.

Center for Educational Research and Innovation, Interdisciplinarity: Problems of Teaching and Research in Universities. (Available from OECD Publications Center, 1750 Pennsylvania Avenue, NW, Washington, DC 20006), 1972.

Jantsch, Erich. "Inter- and Trans-disciplinary University: A Systems Approach to Education and Innovation", Higher Education I: 1 Feb., 1972, pp. 7-37.

The problems cited by these sources, and the maps drawn for future thinking about interdisciplinarity include some thorny patches that any educator who wishes to "get above" discplinarity must sooner or later deal with:

- How does interdiscplinarity resolve the problem of generalist versus specialist education?
- How should educators deal with the multiple levels of interdisciplinarity itself?
- How is it possible to create a new uniform language and set of research predispositions so that genuine transdisciplinary communication can take place?
- And how can instructional systems which are now so heavily weighted towards discipline oriented education be changed?

It is clear that interdisciplinarity is an umbrella term. Jantsch provides a hierarchical framework within this term. (see figure 1, page 9). See:

Humphreys, Les. "Concepts of Unified Education", Unified Studies Reports, I:2 (1974) Boston State College, Boston, MA 02115.

The choice of level on which to work in interdisciplinarity is critical. A teacher who simply wants to "work with" another instructor in another discipline is probably going to be doing multi- or pluri-disciplinary thinking. A research psycho-historian will probably be cross-disciplinary. But a university (or R & D group) with a truly transdisciplinary systems approach to innovation will be doing quite a different sort of thinking. When one adds to this choice a cross matrix of problems concerning research terminology to be used; the level of generalization/specialization desired; and, the kind of predisposition (e.g., inductive/deductive) with which one approaches a problem, the situation becomes exceedingly complex.

The user of this bibliography is cautioned to first clarify policy before embarking on planning. The failure to do so seems to me to be the key to the failure of interdisciplinary experiments in the United States.

PART III. IMPLEMENTING INTERDISCIPLINARITY

After having "gotten ready" and having "thought about" interdisciplinarity, the user of this bibliography may have come to the conclusion that the anomalies of discipline oriented educational practices are of such magnitude for our post-industrial world--and the problems of structuring interdisciplinarity are of such value and challenge--that within the context of one class, or one school, or one university that interdisciplinarity (at some one or more of its levels) should be tried. The obvious next step is to cast glances at teaching styles and unified studies programs which have already been tried.

A beginning can be had by looking at:

Fethe, Charles B. "A Philosophical Model for Interdisciplinary Programs," Liberal Education, LIX #4, December 1974, pp. 490-97.

Finestone, Harry and Michael Shagure. Prospects for the 70's: English Departments and Multi-Disciplinary Studies. New York: Modern Language Association, 1973.

Landau, M., H. Proshansky, and W. Ittelson. "The Interdisciplinary Approach and the Concept of Behavioral Science," in N. Washburne (ed.), Decisions, Values and Groups, II. New York: Macmillan Co., 1962, pp. 7-24.

McInnis, Noel. "Teach the Earth Whole," ERIC Resources in Education #ED 055021, 1971.

Shaw, Gary C. and William D. Crist. "An Inter-Disciplinary Team Teaching Experiment," Improving College and University Teaching. XXI #2, Spring 1973, pp. 159-60.

Sherif, Muzafer and Carol (eds.). Interdisciplinary Relationships in the Social Sciences. Chicago: Aldine Publishers, 1969.

Next, one should examine the evolution of programs in the two areas which seem to be farthest along in the growth of interdisciplinarity: unified science education and environmental education:

Federation for Unified Science Education (FUSE)
Dr. Vicktor Showalter
Box 3138 University Station
Ohio State University
Columbus, Ohio 43210

"New Trends in Integrated Science Teaching." Available from: UNESCO, 7 Place Fontenoy 27200, Paris, France.

Colwell, T. B. "The Laying on of Environmental Education," The Review of Education. I #3, August 1975, pp. 390-401.

There are dozens of programs in these areas including the Unified Science Program at MIT, the Monona Grove Four Year Unified Science Program, the Scottish Integrated Science Scheme, the British Open University Courses in Science and Technology, the California State Department of Education Program in Ekistics, the Ideas Program at Austin College, and curricula at such places as Hiram College, Temple University, and Evergreen State College.

The ERIC system of information access is probably the best research tool for finding information concerning specific teaching styles and programs in interdisciplinarity. At the risk of offending readers who are familiar with ERIC, and because the system is relatively new, I would like to sketch out the process for using this resource collection:

ERIC is the Educational Resources Information Center (National Institute of Education, Washington, DC 20208). This is a federally sponsored agency with regional clearing-houses for information about education.

RIE is a compendium of Resources in Education (formerly called Research in Education, 1967-1974) and is a computer based catalogued and abstracted collection of both published and unpublished documents (including Office of Education research contract reports, etc.). Reports are given ED identifier numbers, are indexed and most are made available in either hard cover or microfiche formats from:

EDRS is the ERIC Document Reproduction Service, P.O. Box 190, Arlington, Virginia 22210.

CIJE is the Current Index to Journals in Education and is also computer based. For the past five years CIJE has been an abstracting and indexing resource for over seven hundred journals in the field of education.

Taken together, RIE and CIJE provide access to abundant sources of information concerning programs involved in interdisciplinarity.

The quickest (and yet trickiest) method for getting ERIC information is to have a library or regional center with appropriate facilities conduct a "computer search" for bibliographical citations and document abstract. This is a relatively inexpensive process (considering the time saved), but does require familiarity with:

ERIC, Thesaurus of ERIC Descriptors (5th edition). New York: Macmillan Co., 1973, updated in current issues of RIE.

Selecting the best descriptors for the computer search is difficult. The usual process is to "cross" a major descriptor with a number of related minor descriptors. For example:

Major Descriptor	Cross Descriptors
UNIFIED STUDIES PROGRAMS	CURRICULUM DEVELOPMENT
	EDUCATIONAL PROGRAMS
or	INTEGRATED CURRICULUM
	FUSED CURRICULUM
INTERDISCIPLINARY	FUTURES (OF SOCIETY)
APPROACHES	LEARNING PROCESSES
	TEACHING TECHNIQUES
	INTEGRATED ACTIVITIES
	(etc.)

The printouts that result from this sort of search will produce hundreds of journal article citations and abstracts (CIJE) as well as published and unpublished reports, studies, program notes, etc. (RIE). These can be the basis for planning interdisciplinary programs that will succeed.

Again, I apologize to readers who are already familiar with

the workings of the ERIC system, but it is the most valuable source of information in quantity of which I am aware, and it should not be passed over lightly.

SUMMARY

This bibliography has attempted to be both developmental and user-oriented. It began with the assumption that the reader was getting ready to think about thinking about interdisciplinarity. And, it proceeded through personal and historical steps to deal with the problems raised by thinking about and implementing interdisciplinarity. Doing interdisciplinarity today is never easy. Without self-guided exploration and learning about the substance of alternative approaches to interdisciplinarity it will be much more difficult. This bibliography is intended to assist you in your search.